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Final Report

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Development of Specification Sheets to Aid Marketing of Oat Products by Canmar Grain Inc. Regina, Saskatchewan

Funded by

The Agriculture Development Fund

FINAL REPORT

DEVELOPMENT OF SPECIFICATION SHEETS TO AID MARKETING OF OAT PRODUCTS BY CANMAR GRAIN INC., REGINA, SASKATCHEWAN

by

K. Sosulski

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INTRODUCTION

Scientific information about the beneficial effects of oat β–glucan in lowering blood cholesterol and plasma lipids and reduction of risks associated with heart and coronary diseases increased popularity of oats in North America (Horn et al. 1986). The demand for oat bran has exceeded the oat supply in 1987 and 1988. Higher prices for oats in 1988 were responsible for increases in acreage planted to oats in 1989 and thus stabilization of oat prices at a lower level.

The Canadian production of oats in 1989 was up 25% over 1988. Statis–tics Canada estimated the 1989 oat production to be 3.5 million tonnes, up 500,000 tonnes from 1988.

With an increase in the supply of oats the markets for oat products became difficult to access for new processors. Saskatchewan oat manufac–turers had to compete with U.S companies, Quaker Oats Co., National Oats Co. Inc., or Robin Hood Multifoods Inc., which have their own research and analytical laboratories. To be competitive with these companies, Saskatchewan manufacturers have to provide specification sheets with compo–sitional data, including amino acids, fatty acids, minerals, vitamins and particle size of the various oat products. They also have to supply the products with the guaranteed levels of protein, dietary fiber, enzymes, etc. Even the less sophisticated oat feed market calls for a guaranteed size and "plumpness" of oat.

The objective of this study was to evaluate the quality of domestic and wild oats available for marketing in the province to generate data necessary for preparation of specification sheets and to assemble the specification sheets for the export market for CanMar Grain, Inc., Regina.

MATERIALS AND METHODS

Samples of several cultivars of oat groats from Saskatchewan's 1989 harvest were provided for analyses by CanMar Grain Inc. in Regina. The company also supplied their products: whole oat meal, oat bran and oat flour.

Whole oat kernels were evaluated for their size and weight.

Oat meal, bran and flour were analyzed for their chemical composition and particle size. Total nitrogen and fat contents were determined by the Micro–Kjeldahl and Soxhlet procedures of AACC (1984), respectively. Moisture and ash were determined by oven drying and ashing at 105°C and 550°C, respectively. Mineral composition of oats was determined on perchloric acid digests using the plasma–mass spectrometer at the SRC's Analytical Laboratory. Starch content in oat products was determined on calcium chloride digests of samples with α amylase and glucoamylase enzymes, followed by determination of released glucose on the Glucostat Apparatus.

Total dietary fiber was assayed using the Sigma Chemical Co. kit following the method of AOAC (1988). The procedure involved the consecutive hydrolyses with α amylase, protease and amyloglucosidase enzymes followed by ethanol precipitation of soluble fiber and separation of the soluble and insoluble fiber by filtration.

Amino acid analyses were performed using a Beckman amino acid analyser following hydrolysis with 6N HCl in sealed evacuated ampules at 100°C for 24 hr (Tkachuk and Irvine, 1969). Cystine and methionine were

measured as cysteic acid and methionine sulfane, resp., after performic acid oxidation and HCl hydrolysis.

Fatty acids were determined by GLC as fatty acid methyl esters following the procedure of Hitchcock and Hammond (1978).

Vitamins were determined using microbiological procedures by the National Environmental Testing Laboratory, Chicago.

Storage stability of oat products was determined by evaluation of the level of free fatty acids (FFA) in oil (AOAC, 1984), and lipase activity. The latter test was conducted with the Lipase Activity kit from Sigma Chemical Co.

RESULTS AND DISCUSSIONS

Calibre and Dumont oat samples harvested in 1989, had comparable kernel length and width (Table 1). However, Calibre oats harvested in 1988 were smaller and thinner than those from 1989. They were also much lighter and the 100–seed weight was only 87% of that in 1989.

Wild oat groats were slightly shorter and much thinner than domestic oats (Table 1). The weight of the 100 seeds was only 55% of the value for domestic oats.

As observed for the domestic oats, the groats of wild oats harvested in 1988 were smaller, thinner and lighter as compared to that of the 1989 harvest. The drought conditions in 1988 could be responsible for the reduction in kernel size, especially since the size of wild oats from the 1987 harvest were comparable to those from 1989.

The domestic and wild oats after cleaning, dehulling and steam inactivation of the native lipase and other enzymes were sold as the stabilized groats or were processed into three products: whole groat flour, bran and low fiber flour. Chemical composition of oat groats and whole oat groat flours are similar as the flour had been obtained by complete milling of the groats (Table 2). Domestic oats contained 15.0% protein, 7.0% fat, and 10% of the total dietary fiber (TDF). Separation of whole oat flour into bran and low fiber flour yielded products distinct in their chemical composition. Protein and total dietary fiber were separated into the bran fraction which contained 3.0% more

protein and 5.0% more fiber than the whole oat flour. The low fiber flour had only 14.0% of protein and 5.5% of TDF.

The wild oat groats and its whole groat flour contained more protein, fat and TDF than the domestic oats (Table 2). Separation of this flour into bran and low fiber flour concentrated fiber, protein and fat in the bran fraction. Bran contained 17.0% of fiber, 25.0% of protein, and 11.0% of fat while the low bran flour had only 6.5% fiber, 16.0% of protein and 9.5% of fat. The low fiber flour is a by–product of bran separation.

Yield of oat bran product and its total dietary fiber content depends on the source of oats, method of production and bran yield. As presented in Table 3, fiber content in the bran fraction could vary from 15.0 to 24.0% of TDF. An increase in fiber content is followed by an increase in protein and fat and by a decrease in starch content.

The proteins in oat and wild oat and their products were intermediate in nutritive value, being comparable in proportion of essential amino acids such as lysine, methionine, threonine and tryptophane (Table 4). Domestic oats contained higher aspartic acid content than wild oats, while the opposite was found for glutamic acid.

The amino acid score of 77.0 was calculated for domestic groats and bran and only 71.0 for flour (Table 4). Threonine was the limiting amino acid of domestic oat groat and all of its products. Phenylalanine was the limiting amino acid for wild oat products and the amino acid score was in the range 72.6–76.7.

The oat bran lipids are rich in palmitic (17.7%), oleic (35.9%) and linoleic (40.4%) fatty acids (Table 5). Oat bran and flour contain comparable levels of these fatty acids. Oleic acid was predominant in wild oat groats and its products.

Phosphorus and potassium are predominant mineral constituents of domestic oats, wild oats and their products (Table 6). Calcium, magnesium, iron, manganese and zinc are micronutrients present in oat products. Both oats and wild oats are low in sodium.

Thiamine, riboflavin, niacin, choline and pantothenic acid were among B–vitamins determined in oat and wild oat samples (Table 6). The majority of vitamins were concentrated during processing into bran fractions, and were present in comparable levels in both bran samples. The exceptions were thiamine and niacin which were slightly lower in wild oat and its products.

Table 1. Range and mean seed size and weight of domestic and wild oat groats.

Oat Samples	Seed Dimensions		Seeds Weight (100 seed) g
	Lenght (mm)	Width (mm)	
Domestic Oat Groats			
Calibre 1989	7.05 5.80 – 8.20	2.62 2.30 – 2.95	2.89
Dumont 1989	7.02 5.00 – 7.85	2.52 2.10 – 3.10	2.89
Calibre 1988	6.44 5.44 – 7.50	1.98 1.90 – 2.60	2.53
Wild Oat Groats			
1989	6.82 5.90 – 7.69	1.51 1.32 – 1.99	1.60
1988	6.40 5.37 – 7.40	1.36 1.15 – 1.63	1.40
1987	6.82 6.2 – 7.18	1.47 1.22 – 1.89	1.57

Table 2. Chemical composition of domestic and wild oat groats and their products.

Product	Protein	Fat	Ash	TDF*	Starch	Moisture
	-% db-					%
Domestic Oats						
Groats	15.0	7.0	2.0	10.0	62.0	10.0
Whole oat flour	15.0	7.0	2.0	10.0	62.0	10.0
Bran	18.0	7.0	2.5	15.0	55.0	10.0
Low fiber flour	14.0	7.0	1.5	5.5	63.0	10.0
Wild Oats						
Groats	21.0	8.5	2.5	12.0	55.0	10.0
Whole oat flour	21.0	8.5	2.5	12.0	55.0	10.0
Bran	25.0	11.0	3.0	17.0	45.0	10.0
Low fiber flour	16.0	9.5	1.5	6.5	62.0	10.0

* TDF – total dietary fiber

Table 3. Chemical composition of bran fractions produced at the range of extraction procedures.

Sample #	TDF*	Protein	Oil	Ash	Starch
	% db				
1	16.1	20.6	9.8	3.1	49.3
2	18.0	22.4	10.0	3.6	44.8
3	21.6	24.6	11.2	4.8	37.0
4	14.9	18.5	7.4	2.4	33.9
5	24.0	20.5	11.2	3.6	30.0

* TDF – total dietary fiber

Table 4. Amino acid composition of domestic and wild oat groats and their products (g/l6g N).

Amino Acid	Domestic Oats			Wild Oats			Human Require–ments
	Groats	Bran	Flour	Groats	Bran	Flour	
Essential for Human Nutrition							
Arg	6.0	6.5	6.7	6.5	6.8	7.2	4.7
His	2.4	2.2	2.4	2.3	2.3	2.5	4.7
Ile	3.7	3.4	3.6	3.6	3.6	3.8	4.2
Leu	7.6	7.4	7.3	7.4	7.3	7.6	7.0
Lys	4.2	3.9	4.1	4.0	3.9	4.0	5.1
Met	2.0	2.2	2.0	1.9	1.9	2.2	2.6
Phe	5.9	5.6	6.0	5.3	5.3	5.6	7.3
Thr	2.7	2.7	2.5	3.1	3.1	3.0	3.5
Try	1.6	1.8	1.6	1.7	1.7	1.6	1.1
Val	5.1	4.8	4.9	5.0	4.8	5.1	4.8
Non–essential for Human Nutrition							
Arg	5.2	4.9	5.1	4.6	4.8	4.9	–
Asp	10.4	9.6	10.2	8.7	8.0	8.5	–
Cys	3.3	3.2	3.2	2.7	2.7	2.9	–
Glu	17.8	16.8	17.2	18.4	18.7	18.8	–
Gly	5.0	4.7	4.8	4.5	4.6	4.7	–
Pro	5.0	4.8	4.9	4.9	4.7	5.0	–
Ser	5.5	5.2	5.4	5.0	5.1	5.3	–
Tyr	4.2	4.0	4.0	3.6	3.8	4.1	–
Total	98.5	93.8	95.9	93.2	92.9	97.4	
AA Score	77.0	77.0	71.0	72.6	72.6	76.7	
Liniting AA	Thr	Thr	Thr	Phe	Phe	Phe	

Table 5. Fatty acid composition of domestic and wild oat groats and their products (% of total fatty acids).

Name		Domestic Oats			Wild Oats		
		Groat	Bran	Flour	Groat	Bran	Flour
Myristic	(14:0)*	0.3	0.2	0.3	0.2	0.2	0.2
Palmitic	(16:0)	17.7	17.6	17.9	14.8	14.1	15.2
Palmitoleic	(16:1)	0.2	0.2	0.2	0.1	0.1	0.1
Stearic	(18:0)	1.6	1.6	1.6	2.0	1.9	2.2
Oleic	(18:1)	35.9	36.0	35.8	43.9	45.2	43.3
Linoleic	(18:2)	40.4	40.3	40.1	34.5	34.1	34.5
Linolenic	(18:3)	1.6	1.6	1.6	1.0	0.9	1.0
Arachidic	(20:0)	0.2	0.1	0.1	0.2	0.2	0.2
11–Eicosenoic	(20:1)	0.8	0.9	0.9	1.1	1.1	1.0
11, 14–Eicosadenoic	(20:2)	0.1	0.0	0.0	0.1	0.0	0.0
Behenic	(22:0)	0.2	0.3	0.3	0.4	0.4	0.4
Erucic	(22:1)	0.6	0.7	0.7	1.0	1.1	1.1
Lignoceric	(24:0)	0.1	0.1	0.1	0.2	0.2	0.1
Nervonic	(24:1)	0.4	0.4	0.4	0.5	0.5	0.6

* No of carbons and unsaturated bonds in fatty acid

Table 6. Mineral composition in domestic and wild oat groats and their products.

		Domestic Oats			Wild Oats		
Mineral	Units	Groat	Bran	Flour	Groat	Bran	Flour
Calcium	%	0.04	0.05	0.02	0.06	0.08	0.03
Phosphorus	%	0.43	0.52	0.27	0.55	0.73	0.30
Potassium	%	0.35	0.41	0.23	0.36	0.46	0.36
Magnesium	%	0.16	0.19	0.08	0.21	0.28	0.08
Iron	ppm	62	66	64	83	72	54
Sodium	ppm	28	28	27	39	41	30
Manganese	ppm	33	38	27	47	54	31
Zinc	ppm	29	33	24	42	48	34

Table 7. Vitamins of group B present in domestic and wild oat groats, brans and flours.

Vitamin	Units	Domestic Oats			Wild Oats		
		Groats	Bran	Flour	Groats	Bran	Flour
Thiamine	mg/100g	0.74	0.88	0.30	0.44	0.87	0.23
Riboflavin	mg/100g	0.12	0.13	0.07	0.16	0.19	0.08
Niacin	mg/100g	1.42	1.62	0.51	1.22	1.45	0.42
Choline	mg/100g	77.1	91.6	41.1	120.0	151.0	57.1
Pantothenic Acid	mg/100g	0.31	0.41	0.28	0.42	0.52	0.30
Folic Acid	mg/100g	0.02	0.03	0.01	0.02	0.04	0.01
Biotin	mg/100g	0.02	0.07	0.02	0.03	0.02	0.01

REFERENCES

AACC, 1984 Approved Methods of the AACC. 8th ed. The American Association of Cereal Chemists. St. Paul, MN.

AOAC, 1985. Changes in Methods. J. Assoc. Off. Anal. Chem. 68, 399.

Hitchcock, C. and E.W. Hammond, 1978. The determination of lipids in foods. In: Developments in Food Analysis Techniques. Ed. King, R.D. Applied Sci. Publishers, London, p.185.

Tkachuk, R. and G.N. Irvine, 1969. Amino acid composition of cereal and oilseed meals. Cereal Chem. 46, 206.

STATEMENT OF EXPENDITURE

Labour Cost	
Professional	$4,817.20
Technical	$7,762.08
Equipment Maintenance	$ 600.00
Material and Supplies	$1,997.94
Cost of Analysis	$4,337.80
TOTAL	$19,515.02

STATEMENT OF INCOME

ADF	paid	$14,415.00
	holdback	$3,600.00
CanMar Inc.		$1,500.00
	Total	$19,515.00

PERSONNEL INVOLVED IN THE PROJECT:

Professional

Dr. K. Sosulski	5% of the total time

Technical

Mrs. Betty Swerhorne	12% of the total time

PUBLICATIONS

K. Sosulski, 1990. Total compositional analysis of domestic and wild oat bran. CIFST National Conference, Saskatoon, June 3–6.

Can Mar Grain Inc.

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Telex: 071-2619 (CMAR WCAN REG.)

OAT GROATS

Oat groats are cleaned, dehulled kernels of domestic oats, cultivar Calibre, steam treated to inactivate enzymes

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	15.0 ± 1.0	AACC 46–13
Fat	% db	7.0 ± 1.0	AACC 30–20
Ash	% db	2.0 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	10.0 ± 1.0	AACC 43.A14
Starch	% db	62.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Colour	Golden Brown
Flavour	Natural Oat Flavour

Minerals (mg/100 g)

Calcium	38	Sodium	2
Phosphorus	430	Iron	6
Potassium	350	Zinc	3
Magnesium	160	Manganese	3

Essential Amino Acids (g/100g protein)

Arginine	6.9	Methionine	2.0
Histidine	2.4	Phenylalanine	5.9
Isoleucine	3.7	Threonine	2.7
Leucine	7.6	Tryptophane	1.6
Lysine	4.2	Valine	5.1

Fatty Acids (% of total fatty acids)

C 16:0	Palmitic 17.7	C 18:2	Linoleic 40.4
C 18:0	Stearic 1.6	C 18:3	Linolenic 1.6
C 18:1	Oleic 35.9		

B Vitamins (mg/100g)

Thiamine	0.74	Choline	77.1
Riboflavin	0.12	Folic acid	0.02
Niacin	1.42	Biotin	0.02
Pantothenic acid	0.31		

Vitamin A (IU/100g) .. 98.5

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WILD OAT GROATS

Wild oat groats are cleaned, dehulled and steam heated to inactivate enzymes.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	21.0 ± 1.0	AACC 46–13
Fat	% db	8.5 ± 1.0	AACC 30–20
Ash	% db	2.5 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	12.5 ± 1.0	AACC 43.A14
Starch	% db	55.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Colour	Golden Brown
Flavour	Nutty Oat Flavour

Minerals (mg/100 g)

Calcium	64	Sodium	4
Phosphorus	550	Iron	8
Potassium	360	Zinc	4
Magnesium	210	Manganese	5

Essential Amino Acids (g/100g protein)

Arginine	6.5	Methionine	1.9
Histidine	2.3	Phenylalanine	5.3
Isoleucine	3.6	Threonine	3.1
Leucine	7.4	Tryptophane	1.7
Lysine	4.0	Valine	5.0

Fatty Acids (% of total fatty acids)

C 16:0	Palmitic	14.8	
C 18:0	Stearic	2.4	
C 18:1	Oleic	43.9	
C 18:2	Linoleic	34.5	
C 18:3	Linolenic	1.0	

B Vitamins (mg/100g)

Thiamine	0.44	Choline	120.0
Riboflavin	0.16	Folic acid	0.02
Niacin	1.22	Biotin	0.03
Pantothenic acid	0.42		

Vitamin A (IU/100g) . . 59.4

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WHOLE OAT FLOUR

Whole oat flour is milled from cleaned, dehulled and steam heated white oats.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	15.0 ± 1.0	AACC 46–13
Fat	% db	7.0 ± 1.0	AACC 30–20
Ash	% db	2.0 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	10.0 ± 1.0	AACC 43.A14
Starch	% db	62.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	15.0 ± 5.0
On US #30	%	45.0 ± 10.0
On US #40	%	30.0 ± 10.0
On US #40	%	10.0 ± 5.0
Flavour		Natural Oat Flavour

Minerals (mg/100 g)

Calcium	38	Sodium	2
Phosphorus	430	Iron	6
Potassium	350	Zinc	3
Magnesium	160	Manganese	3

Essential Amino Acids (g/100g protein)

Arginine	6.9	Methionine	2.0
Histidine	2.4	Phenylalanine	5.9
Isoleucine	3.7	Threonine	2.7
Leucine	7.8	Tryptophane	1.6
Lysine	4.2	Valine	5.1

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	17.7	C 18:2 Linoleic	40.4
C 18:0 Stearic	1.6	C 18:3 Linolenic	1.6
C 18:1 Oleic	35.9		

B Vitamins (mg/100g)

Thiamine	0.74	Choline	77.1
Riboflavin	0.12	Folic acid	0.02
Niacin	1.42	Biotin	0.02
Pantothenic acid	0.31		

Vitamin A (IU/100g) .. 98.5

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WHOLE WILD OAT FLOUR

Whole wild oat flour is milled from cleaned, dehulled and steam heated groats.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	21.0 ± 1.0	AACC 46–13
Fat	% db	8.5 ± 1.0	AACC 30–20
Ash	% db	2.5 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	12.0 ± 1.0	AACC 43.A14
Starch	% db	55.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	10.0 ± 5.0
On US #30	%	40.0 ± 10.0
On US #40	%	30.0 ± 10.0
Thru US #40	%	20.0 ± 5.0
Flavour		Nutty Oat Flavour

Minerals (mg/100 g)

Calcium	64	Sodium	4
Phosphorus	550	Iron	8
Potassium	360	Zinc	4
Magnesium	210	Manganese	5

Essential Amino Acids (g/100g protein)

Arginine	6.5	Methionine	1.9
Histidine	2.3	Phenylalanine	5.3
Isoleucine	3.6	Threonine	3.1
Leucine	7.4	Tryptophane	1.7
Lysine	4.0	Valine	5.0

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	14.8	C 18:2 Linoleic	34.5
C 18:0 Stearic	2.0	C 18:3 Linolenic	1.0
C 18:1 Oleic	43.9		

B Vitamins (mg/100g)

Thiamine	0.44	Choline	120.0
Riboflavin	0.16	Folic acid	0.02
Niacin	1.22	Biotin	0.03
Pantothenic acid	0.42		

Vitamin A (IU/100 g) . . 59.4

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OAT BRAN

Oat bran is separated from cleaned, dehulled and steam heated white oats.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	18.0 ± 1.0	AACC 46–13
Fat	% db	7.0 ± 1.0	AACC 30–20
Ash	% db	2.5 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	15.0 ± 1.0	AACC 43.A14
Starch	% db	55.5 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	30.0 ± 10.0
On US #30	%	50.0 ± 10.0
On US #40	%	15.0 ± 5.0
Thru US #40	%	5.0 Maximum
Flavour		Natural Oat Flavour

Minerals (mg/100 g)

Calcium	47	Sodium	3
Phosphorus	520	Iron	7
Potassium	410	Zinc	3
Magnesium	190	Manganese	4

Essential Amino Acids (g/100g protein)

Arginine	6.5	Methionine	2.2
Histidine	2.2	Phenylalanine	5.6
Isoleucine	3.4	Threonine	2.7
Leucine	7.4	Tryptophane	1.8
Lysine	3.9	Valine	4.8

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	17.6	C 18:2 Linoleic	40.3
C 18:0 Stearic	1.4	C 18:3 Linolenic	1.6
C 18:1 Oleic	36.0		

B Vitamins (mg/100g)

Thiamine	0.88	Choline	91.6
Riboflavin	0.13	Folic acid	0.02
Niacin	1.63	Biotin	0.07
Pantothenic acid	0.41		

Vitamin A (IU/100g) .. 98.3

Can Mar Grain Inc.

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WILD OAT BRAN

Wild oat bran is separated from cleaned, dehulled and steam heated groats.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	25.0 ± 2.0	AACC 46–13
Fat	% db	11.0 ± 1.0	AACC 30–20
Ash	% db	3.0 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	17.0 ± 1.0	AACC 43.A14
Starch	% db	45.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	20.0 ± 10.0
On US #30	%	50.0 ± 10.0
On US #40	%	25.0 ± 10.0
Thru US #40	%	5.0 Maximum
Flavour		Unique Nutty Oat Flavour

Minerals (mg/100 g)

Calcium	81	Sodium	4
Phosphorus	730	Iron	7
Potassium	460	Zinc	5
Magnesium	280	Manganese	5

Essential Amino Acids (g/100g protein)

Arginine	6.8	Methionine	1.9
Histidine	2.3	Phenylalanine	5.3
Isoleucine	3.6	Threonine	3.1
Leucine	7.3	Tryptophane	1.7
Lysine	3.9	Valine	4.8

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	14.1	C 18:2 Linoleic	34.1
C 18:0 Stearic	1.9	C 18:3 Linolenic	0.9
C 18:1 Oleic	45.2		

B Vitamins (mg/100g)

Thiamine	0.87	Choline	151.0
Riboflavin	0.19	Folic acid	0.04
Niacin	1.45	Biotin	0.02
Pantothenic acid	0.52		

Vitamin A (IU/100g) .. 58.8

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LOW FIBER OAT FLOUR

Low fiber oat flour remains after separation of bran from cleaned, dehulled and steam heated white oat kernels.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	14.0 ± 1.0	AACC 43–13
Fat	% db	7.0 ± 1.0	AACC 30–20
Ash	% db	1.5 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	5.5 ± 1.0	AACC 43.A14
Starch	% db	63.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	0
On US #30	%	5.0 ± 3.0
On US #40	%	60.0 ± 10.0
Thru US #40	%	35.0 ± 10.0
Flavour		Natural Oat Flavour

Minerals (mg/100 g)

Calcium	25	Sodium	3
Phosphorus	270	Iron	6
Potassium	230	Zinc	2
Magnesium	85	Manganese	3

Essential Amino Acids (g/100g protein)

Arginine	6.7	Methionine	2.0
Histidine	2.4	Phenylalanine	6.0
Isoleucine	3.6	Threonine	2.5
Leucine	7.3	Tryptophane	1.6
Lysine	4.1	Valine	4.9

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	17.9	C 18:2 Linoleic	40.1
C 18:0 Stearic	1.6	C 18:3 Linolenic	1.6
C 18:1 Oleic	35.8		

B Vitamins (mg/100g)

Thiamine	0.30	Choline	41.1
Riboflavin	0.07	Folic acid	0.01
Niacin	0.51	Biotin	0.02
Pantothenic acid	0.28		

Vitamin A (IU/100g) .. 97.9

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LOW FIBER WILD OAT FLOUR

Low fiber wild oat flour remains after separation of bran from cleaned, dehulled and steam heated groats.

Chemical Analyses

			Test Method
Protein (N x 6.25)	% db	16.0 ± 1.0	AACC 43–13
Fat	% db	9.5 ± 1.0	AACC 30–20
Ash	% db	1.5 ± 0.5	AACC 08–01
Total Dietary Fiber	% db	6.5 ± 1.0	AACC 43.A14
Starch	% db	62.0 ± 2.0	AOAC 14.075
Moisture	%	10.0 Maximum	AACC 44–15A
Lipase Activity		Inactivated	Peroxidase

Physical Properties

Granulation		
On US #14	%	0
On US #20	%	0
On US #30	%	5.0 ± 3.0
On US #40	%	50.0 ± 10.0
Thru US #40	%	45.0 ± 10.0
Flavour		Nutty Oat Flavour

Minerals (mg/100 g)

Calcium	34	Sodium	3
Phosphorus	300	Iron	5
Potassium	360	Zinc	3
Magnesium	86	Manganese	3

Essential Amino Acids (g/100g protein)

Arginine	7.2	Methionine	2.2
Histidine	2.5	Phenylalanine	5.6
Isoleucine	3.8	Threonine	3.0
Leucine	7.6	Tryptophane	1.6
Lysine	4.0	Valine	5.1

Fatty Acids (% of total fatty acids)

C 16:0 Palmitic	15.2	C 18:2 Linoleic	34.5
C 18:0 Stearic	2.2	C 18:3 Linolenic	1.0
C 18:1 Oleic	43.3		

B Vitamins (mg/100g)

Thiamine	0.23	Choline	57.1
Riboflavin	0.08	Folic acid	0.01
Niacin	0.42	Biotin	0.01
Pantothenic acid	0.30		

Vitamin A (IU/100g) .. 69.0